# PATENT ABSTRACTS OF JAPAN

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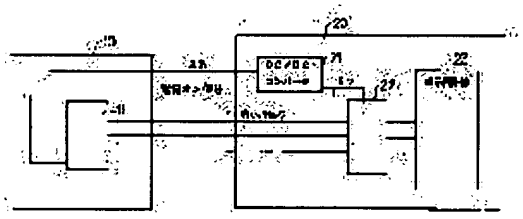
## (54) LIQUID CRYSTAL DISPLAY DEVICE AND INFORMATION PROCESSING SYSTEM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a liquid crystal display device in which voltages being out of ratings are prevented from being impressed on circuit elements in the liquid crystal display device before the power source of the device is turned on.
SOLUTION: This liquid crystal display device 20 displays a picture on a liquid crystal display panel based on display data and control signals to be inputted from the outside. In this case, the device has a boosting circuit 21 in the inside of the device and when the power source of the device is turned on, the device 20 outputs a power source on signal indicating that the output voltage to be outputted from the boosting circuit 21 became a prescribed voltage with respect to the outside.



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* NOTICES *



DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] With respect to a liquid crystal display, especially this invention has a booster circuit inside, applies it to the liquid crystal display into which the signal for a display is inputted from the body section of a computer, and relates to an effective technique.
[0002]
[Description of the Prior Art] Conventionally, the liquid crystal display module of the TFT (Thin Film Transistor) method used for the display sections, such as a notebook computer, is known as one of the liquid crystal displays.
[0003] This liquid crystal display module impresses a sequential selection electrical potential difference to a gate signal line from a gate driver based on the signal for a display (each control signal of an indicative data and a clock signal, a display timing signal, a Horizontal Synchronizing signal, and a Vertical Synchronizing signal) sent out from the body section of a computer. Moreover, according to it, an image is displayed on a liquid crystal display panel by impressing the image electrical potential difference based on an indicative data to a drain signal line from a drain driver.
[0004] In addition, these techniques are indicated by Japanese Patent Application No. No. 58983 [ seven to ].
[0005]
[Problem(s) to be Solved by the Invention] In the information processor which uses this liquid crystal display module as the display section, there was a case where the signal for a display was sent out to a liquid crystal display module, from the body section of a computer regardless of power-source ON and coincidence of an information processor, or the power sequencing by the side of a liquid crystal display module.
[0006] In such a case, it set, the electrical potential difference besides rating was impressed in the circuit element of the input interface section of a liquid crystal display module to a circuit element, like a signal level becomes high from the supply voltage of the circuit element concerned, and, thereby, there was a possibility that a current might continue flowing from a power supply terminal to a signal terminal.
[0007] By the time the output of a booster circuit started after the power source of an information processor became ON when a liquid crystal display module had booster

circuits, such as a DC to DC converter, in the interior especially, the electrical potential difference besides rating was easy to be impressed to the circuit element of the input interface section of said liquid crystal display module, and there was a trouble of being easy to produce the phenomenon in which a current continues flowing to a signal terminal from a power supply terminal.

[0008] It is made in order that this invention may solve the trouble of said conventional technique, and in a liquid crystal display, the object of this invention is to offer the technique which becomes possible [ preventing that the electrical potential difference besides rating is impressed to the circuit element in a liquid crystal display ], before the power source serves as ON.

[0009] In an information processor, other objects of this invention are to offer the technique which becomes possible [ preventing that the electrical potential difference besides rating is impressed to the circuit element in a liquid crystal display ], before the power source of a liquid crystal display serves as ON.

[0010] Other objects and new descriptions are clarified by a publication and accompanying drawing of this description at said object list of this invention.

[0011]

[Means for Solving the Problem] It will be as follows if the outline of a typical thing is briefly explained among invention indicated in this application.

[0012] In the liquid crystal display which controls the electrical potential difference impressed to a liquid crystal layer based on the indicative data and control signal which are inputted from the outside, and displays an image on a liquid crystal display panel, said liquid crystal display has a power-source ON signal output means to output the power-source ON signal showing the power source of said liquid crystal display having become ON, to the exterior.

[0013] Said liquid crystal display has a booster circuit inside, and when the output voltage to which said power-source ON signal output means is outputted from said booster circuit by the power source of said liquid crystal display serving as ON turns into predetermined output voltage, a power-source ON signal is outputted.

[0014] Said power-source ON signal is output voltage outputted from said booster circuit.

[0015] Said power-source ON signal output means has the connection material which connects the internal signal line which outputs a power-source ON signal, and said internal signal line and external signal line.

[0016] In the information processor which possesses at least the body section which has a central processing unit, and the liquid crystal display indicated by claim 1 thru/or claim 4, said body section possesses a sending-out means to send out at least one of said indicative data or the control signals, to said liquid crystal display based on the power-source ON signal outputted from said power-source ON signal output means.

[0017] Said sending-out means does not have the delivery to said liquid crystal display in at least one of said indicative data or the control signals, when the power-source ON signal which sends out at least one of said indicative data or the control signals to said liquid crystal display, and is outputted from said power-source ON signal output means when the power-source ON signal outputted from said power-source ON signal output means is a predetermined voltage level is not a predetermined voltage level.

[0018]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail with reference to a drawing.

[0019] In addition, in the complete diagram for explaining the gestalt of implementation of invention, what has the same function attaches the same sign, and explanation of the repeat is omitted.

[0020] Drawing 1 is the block diagram showing the outline configuration of the interface section of the body section of a computer and the liquid crystal display module in the information processor which is the gestalt of implementation of 1 invention of this invention.

[0021] The body section 10 of a computer shown in this drawing possesses the output-buffer circuit section 11 which sends out the signal for a display, and the liquid crystal display module 20 of a TFT method has DC to DC converter 21, and the input-buffer circuit section 22 and the display circuit section 23. This DC to DC converter 21 carries out pressure up of the supply voltage of 3.3V supplied from the body section 10 of a computer, and generates the internal electrical power source electrical potential difference of 5V at least.

[0022] In order that the input-buffer circuit section 22 may operate by 5V, the internal electrical power source electrical potential difference of DC to DC converters 21-5V is supplied to the input-buffer circuit section 22. Moreover, the internal electrical power source electrical potential difference of these DC to DC converters 21-5V is supplied also to the output-buffer circuit section 11 of the body section 10 of a computer as a power-source ON signal.

[0023] This output-buffer circuit section 11 does not have the delivery to a liquid crystal display module in the signal for a display, when the signal for a display is sent out to a liquid crystal display module when the power-source ON signal (internal electrical power source electrical potential difference of DC to DC converters 21-5V) of High level is inputted, and the power-source ON signal of Low level is inputted.

[0024] In this case, the external power line which supplies the supply voltage of the body sections 10-3.3V of a computer, the external signal line which sends out the signal for a display from the body section 10 of a computer, and the external signal line which sends out the power-source ON signal from the liquid crystal display module 20 are connected to each internal electrical power source line and internal signal line in the liquid crystal display module 20 through a connector.

[0025] Drawing 2 is drawing showing the timing chart in the gestalt of this operation.

[0026] If the power source of the body section 10 of a computer serves as ON as shown in this drawing, the supply voltage of the body sections 10-3.3V of a computer will be supplied to the liquid crystal display module 20. However, since DC to DC converter 21 does not immediately start, by the time the internal electrical power source electrical potential difference of DC to DC converters 21-5V is outputted, a predetermined time delay (T1) will be needed.

[0027] And if a predetermined time delay (T1) passes and the internal electrical power source electrical potential difference of DC to DC converters 21-5V is outputted, a power-source ON signal serves as High level, and sends out the signal for a display to the liquid crystal display module 20 in the output-buffer circuit section 11.

[0028] Drawing 3 is the block diagram showing the outline configuration of the

interface section of the body section of a computer and the liquid crystal display module in the conventional information processor.

[0029] As shown in this drawing, in the conventional example, a power-source ON signal is not sent out to the output-buffer circuit section 11 of the body section 10 of a computer.

[0030] Drawing 4 is drawing showing the timing chart in the conventional example shown in drawing 3 .

[0031] If the power source of the body section 10 of a computer serves as ON as shown in this drawing, the supply voltage of the body sections 10-3.3V of a computer will be supplied to the liquid crystal display module 20. However, since DC to DC converter 21 does not immediately start, by the time the internal electrical power source electrical potential difference of DC to DC converters 21-5V is outputted, predetermined time amount (T1) will be needed.

[0032] When the signal for a display is sent out from the body section 10 of a computer to the liquid crystal display module 20 in this time amount (T1), the electrical potential difference besides rating will be impressed to the input-buffer circuit section 22. Thereby, there was a possibility that the circuit element in the input-buffer circuit section 22 might be destroyed.

[0033] Drawing 5 is drawing showing the important section circuitry of an example of the output-buffer circuit section 11 shown in drawing 3 , and the input-buffer circuit section 22.

[0034] In the example shown in this drawing, the output-buffer circuit section 11 has the output inverter circuit 31, and the input-buffer circuit 22 has the input inverter circuit 32. Protection diode (33 34) is connected to the input stage of this input inverter circuit 32. In addition, in drawing 5 , the protection diode 33 is an NMOS transistor and the protection diode 34 shows the example constituted from a PMOS transistor.

[0035] Drawing 6 is drawing showing the structure of the protection diode (33 34) shown in drawing 5 .

[0036] In this drawing, the protection diode 33 consists of NMOS transistors formed in p form substrate 40, and the protection diode 34 consists of PMOS transistors formed in n form well 41 prepared in p form substrate 40. Here, the signal for a display is impressed to the signal terminal 42.

[0037] If the signal for a display shall be now impressed to the signal terminal 42 before the internal supply voltage of DC to DC converters 21-5V is impressed to the protection diode 34 as shown in drawing 4 , the PN junction currently formed between drain 34a of the protection diode 34 and source 34b will serve as the forward direction, and a current will flow from the signal terminal 42 to a power supply terminal 43.

[0038] Even if the thyristor by the parasitism pnp transistor and parasitism npn transistor which contain the protection diode 34 depending on the case removed the overvoltage which will be in switch-on and becomes a cause eventually by that cause, a high current continued flowing, and there was a possibility that a semiconductor integrated circuit might be destroyed by generation of heat by the overcurrent or the overcurrent.

[0039] In the gestalt of this operation however, a power-source ON signal from the liquid crystal display module 20 It sends out to the output-buffer circuit section 11 of the body section 10 of a computer. In the output-buffer circuit section 11

Until the power-source ON signal (internal electrical power source electrical potential difference of DC to DC converters 21-5V) of High level is inputted Since the signal for a display was sent out and twisted to the liquid crystal display module 20 and it was made like, destruction of the semiconductor integrated circuit by the thyristor actuation including the PN-junction forward direction currently formed between drain 34a of the protection diode 34 and source 34b which were described above is lost.

[0040] Drawing 7 is drawing showing the important section circuitry of an example of the output-buffer circuit section 11 of the gestalt of this operation, and the input-buffer circuit section 22.

[0041] Tri-state inverter circuit 31a is used for the example shown in this drawing as an output inverter circuit of the output-buffer circuit section 11. Since the internal electrical power source electrical potential difference of 5V is impressed to that control terminal when that output will be in a hi-z state and the power-source ON signal of High level is inputted from the liquid crystal display module 20, since, as for this tri-state inverter circuit 31a, reference voltage is impressed to that control terminal through a pull down resistor (R1) when the power-source ON signal of High level is not inputted from the liquid crystal display module 20, the usual inverter circuit is operated.

[0042] Thus, according to the gestalt of this operation, it is lost that the electrical potential difference besides rating is impressed to the circuit element of the input interface section of the liquid crystal display module 20, and it becomes possible to raise the dependability of the liquid crystal display module 20. Moreover, since the degree of freedom of a power sequencing design of the body section 10 of a computer improves, it becomes possible to reduce cost.

[0043] In addition, in the gestalt of this operation, although it was made to impress the internal electrical power source electrical potential difference of DC to DC converters 21-5V of the liquid crystal display module 20 to the output-buffer section 11 of the body section 10 of a computer as a power-source ON signal It is not limited to this but you may make it impress the electrical potential difference which pressured partially the internal electrical power source electrical potential difference of DC to DC converters 21-5V according to the circuit element which constitutes the output-buffer section 11 of the body section 10 of a computer.

[0044] Moreover, although the example shown in drawing 5 and drawing 7 explained the example which has an output inverter circuit (31 31a) and the input inverter circuit 32 to the output-buffer circuit section 11 and the input-buffer circuit section 22, it is also possible to replace with an output inverter circuit (31 31a) and the input inverter circuit 32, and to use an output-buffer circuit and an input-buffer circuit.

[0045] Furthermore, regardless of the power sequencing of the liquid crystal display module 20, although the liquid crystal display module 20 which has DC to DC converter 21 inside was mentioned as the example and explained, also when the signal for a display is sent out from the body section 10 of a computer to the liquid crystal display module 20, this invention is effective in the gestalt of this operation.

[0046] Drawing 8 is the block diagram showing the outline configuration of the liquid crystal display module 10 shown in drawing 1 .

[0047] The liquid crystal display module of the TFT method shown in this drawing

consists of a liquid crystal display panel (TFT-LCD), two or more drain drivers 130, two or more gate drivers 140, and the interface section 100. This interface section 100 possesses a display control 110 and a power supply section 120. In addition, said input-buffer circuit section 22 and display circuit section 23 constitute a display control 110.

[0048] Each output terminal of each drain driver 130 is connected to the drain signal line with which it corresponds in a liquid crystal display panel (TFT-LCD), and the drain electrode of the thin film transistor (TFT) of the direction of a train is connected to each drain signal line, respectively. The output terminal of each gate driver 140 is connected to the gate signal line by which it corresponds in a liquid crystal display panel (TFT-LCD), and the gate electrode of the thin film transistor of a line writing direction is connected to each gate signal line, respectively.

[0049] Since the source electrode of a thin film transistor is connected to a pixel electrode and a liquid crystal layer is prepared between a pixel electrode and a common electrode (counterelectrode), between the source electrode of a thin film transistor, and a common electrode, liquid crystal capacity (CLC) is connected equivalent.

[0050] A display control 110 mainly consists of one semiconductor integrated circuit (LSI). This display control 110 controls and drives the drain driver 130 and a gate driver 140 in the usual actuation based on each control signal of the clock signal (CL) sent out from the body side of a computer, a display timing signal (DTMG), a Horizontal Synchronizing signal (Hsync), and a Vertical Synchronizing signal (Vsync), and the data (R-G-B) for a display.

[0051] An image is displayed on a liquid crystal display panel by impressing a sequential selection electrical potential difference to a gate signal line from a gate driver 140, and impressing the image electrical potential difference based on an indicative data to a drain signal line from the drain driver 130 simultaneously by that cause.

[0052] In addition, in drawing 8 , a signal line for a signal line 131 to send out the clock signal for an indicative-data latch (D2) to the drain driver 130 and a signal line 132 are signal lines for sending out the clock signal for output timing control for outputting the image electrical potential difference based on an indicative data to a drain signal line from the drain driver 130 (D1). Moreover, a data bus 133 is a data bus which outputs the indicative data of simple 1 received train to the drain driver 130.

[0053] Moreover, the signal line with which a signal line 141 outputs the shift clock signal (G1) of 1 horizontal-scanning time period to a gate driver 140, and a signal line 142 are signal lines which output a frame start indication signal to a gate driver 140.

[0054] A power supply section 120 generates and outputs the forward electrical potential difference which have DC-DC converter 21, and said internal electrical power source electrical potential difference of 5V is generated, and also is supplied to the drain driver 130 and the gradation gradation reference voltage of a negative electrical potential difference, the gate voltage supplied to the gate electrode of a thin film transistor, and the common electrical potential difference supplied to a common electrode (confrontation electrode).

[0055] In addition, in the gestalt of said operation, although the case where this

invention was applied to an information processor equipped with the liquid crystal display module of a TFT method was explained, it cannot be overemphasized that a liquid crystal display module is not limited to the liquid crystal display module of a TFT method, and it can apply also to the liquid crystal display module of a STN method.

[0056] Furthermore, this invention is applicable also to the liquid crystal display monitor to which it is the liquid crystal display monitor of a digital interface method which uses a digital signal, for example, a LVDS (Low Voltage Differential Signaling) method, as a signal-transmission method between the body section of a computer, and a liquid crystal display module, and the signal for a display is transmitted from a computer.

[0057] As mentioned above, although this invention was concretely explained based on the gestalt of implementation of invention, it cannot be overemphasized that it can change variously in the range which this invention is not limited to the gestalt of implementation of said invention, and does not deviate from the summary.

[0058]

[Effect of the Invention] It will be as follows if the effectiveness acquired by the typical thing among invention indicated in this application is explained briefly.

[0059] According to this invention, it prevents carelessly that the electrical potential difference besides rating is impressed to the circuit element in a liquid crystal display from an external device, and it becomes possible about the circuit element in a liquid crystal display being destroyed to prevent beforehand.

[0060] It becomes possible to raise by this the dependability of the information processor which uses a liquid crystal display or a liquid crystal display as the display section.

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[Translation done.]

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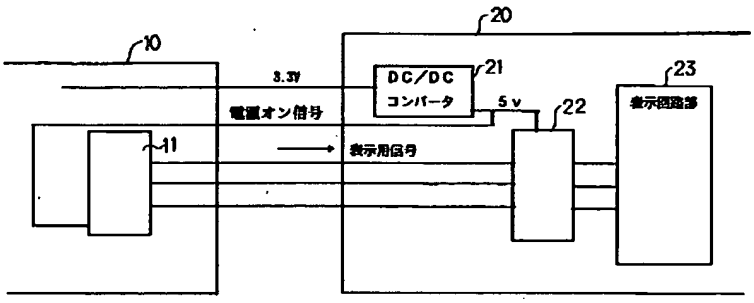
T液晶表示パネル、R1…抵抗。

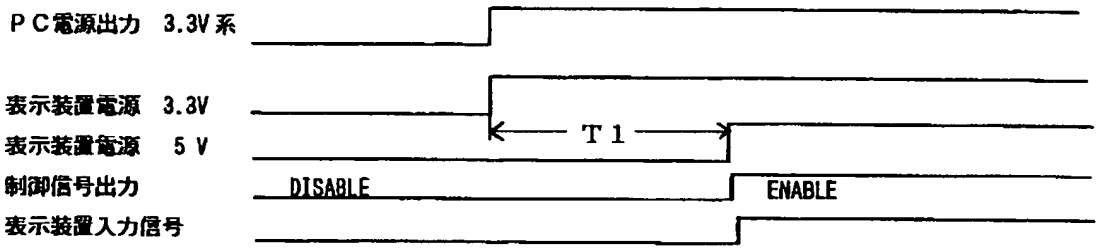
【図1】

図1




【図2】

図2

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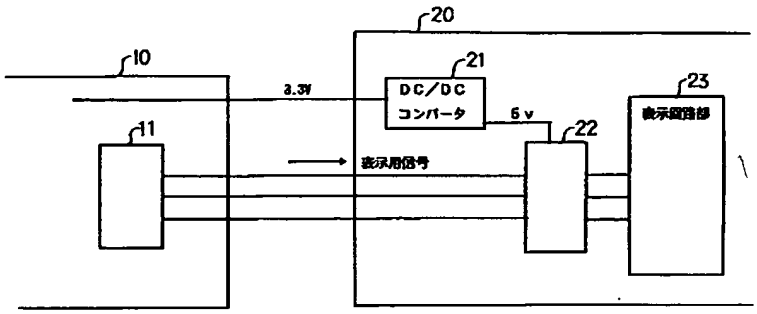
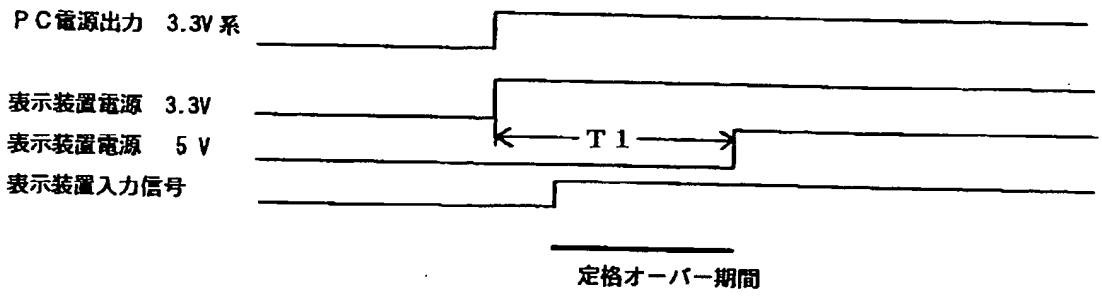
【図3】

図3



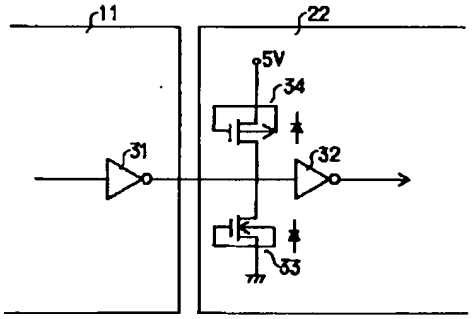
【図4】

図4



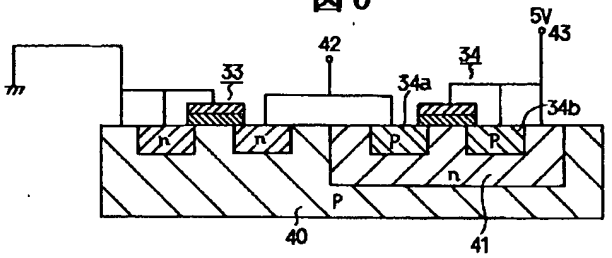

【図5】

図5



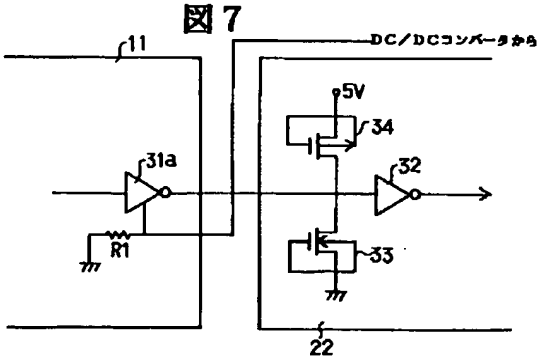

【図6】

図6



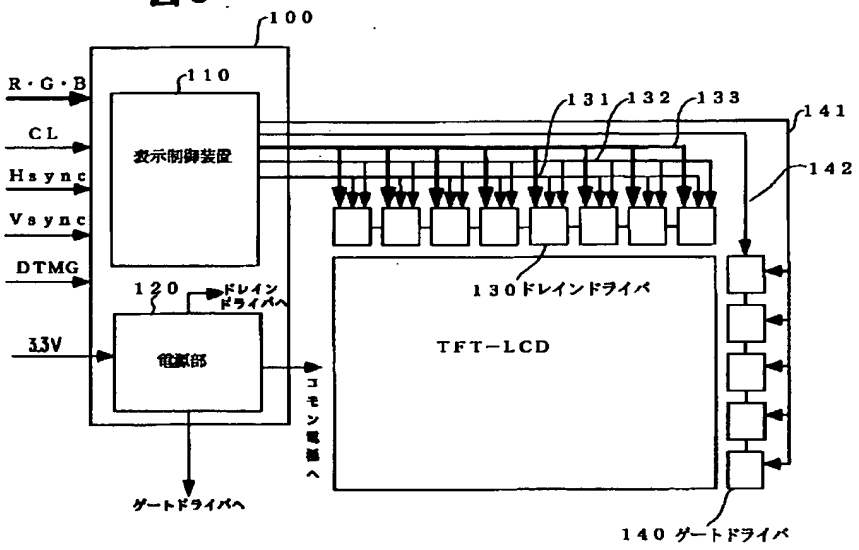

【図7】

図7



【図8】

図8

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